



To Trade or Not to Trade: Analyzing how Perturbations Travel in Sparsely Connected Networks

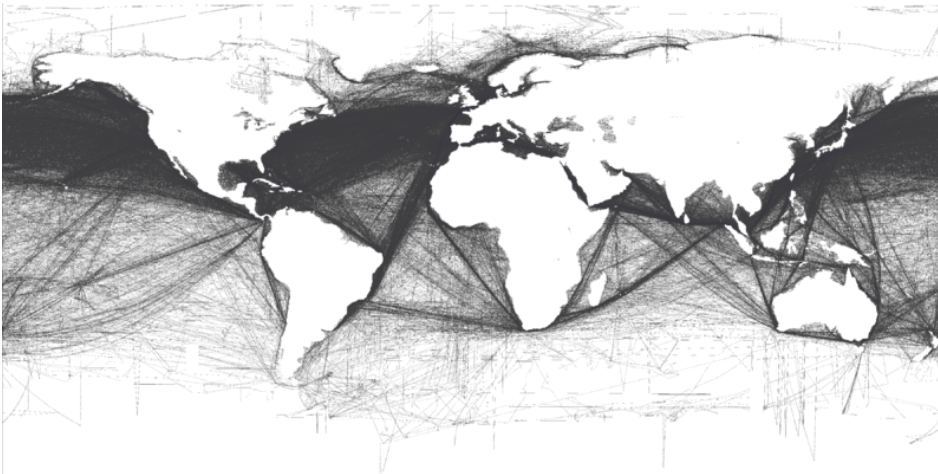
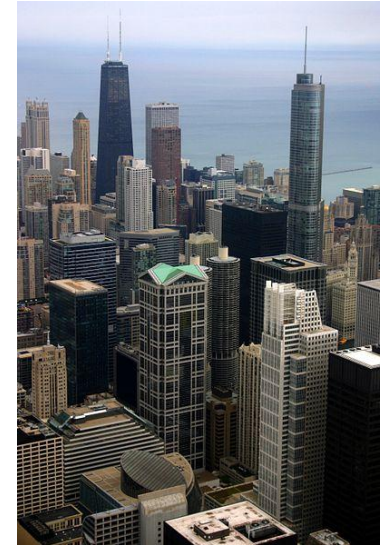
Marshall A. Kuypers

Walter E. Beyeler, Matthew Antognoli, Michael D. Mitchell, Robert J. Glass

Sandia National Laboratories

2nd International Conference on Complex Sciences: Theory and Applications
Santa Fe, New Mexico, United States
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Background



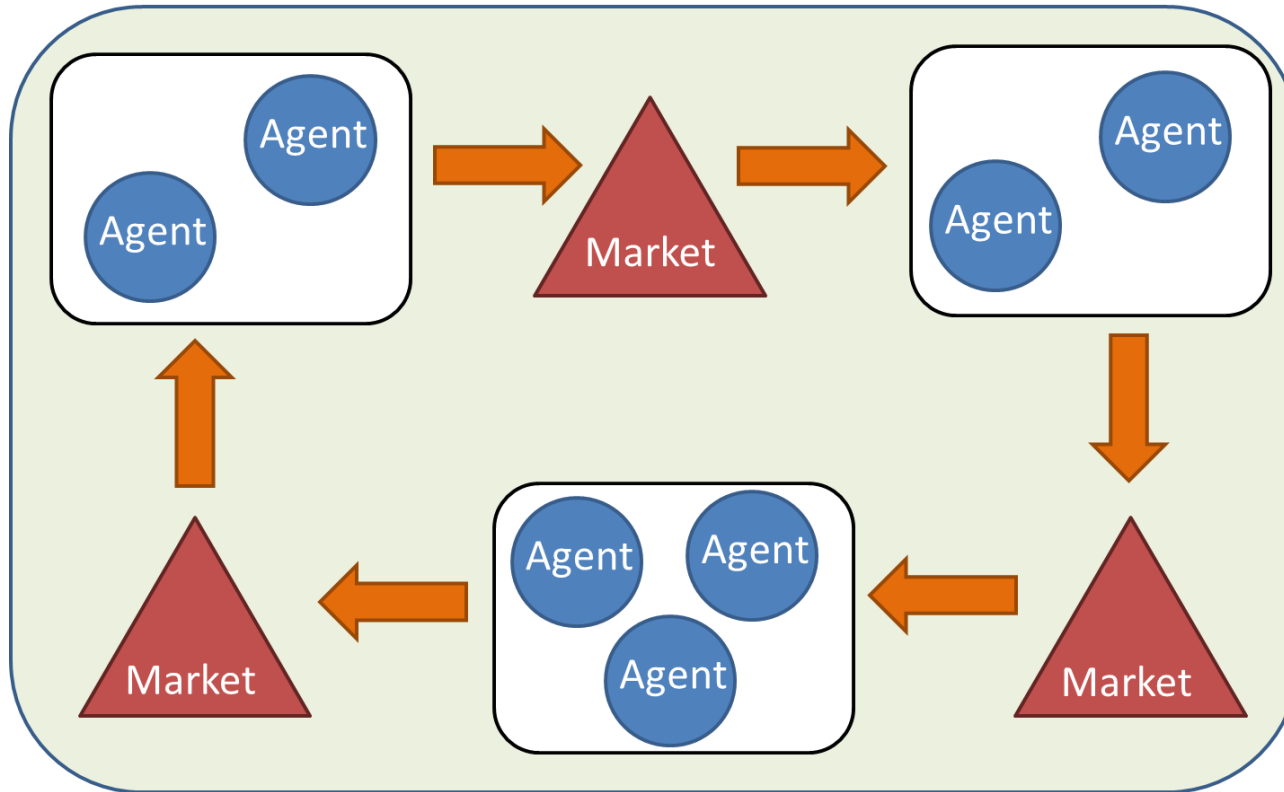
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- International Relations (IR) has not embraced CS
- Axelrod (1997) showed CS is applicable
- Some work on contagion, but limited to finance

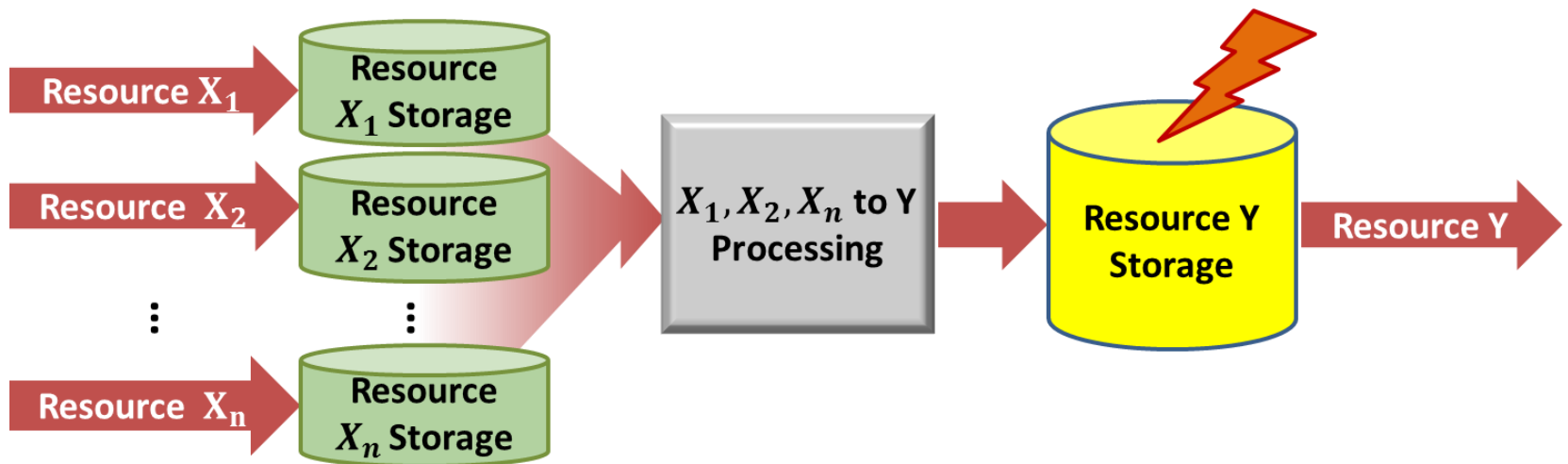


Images credits from left to right: Aotearoa, Cassandra Thompson

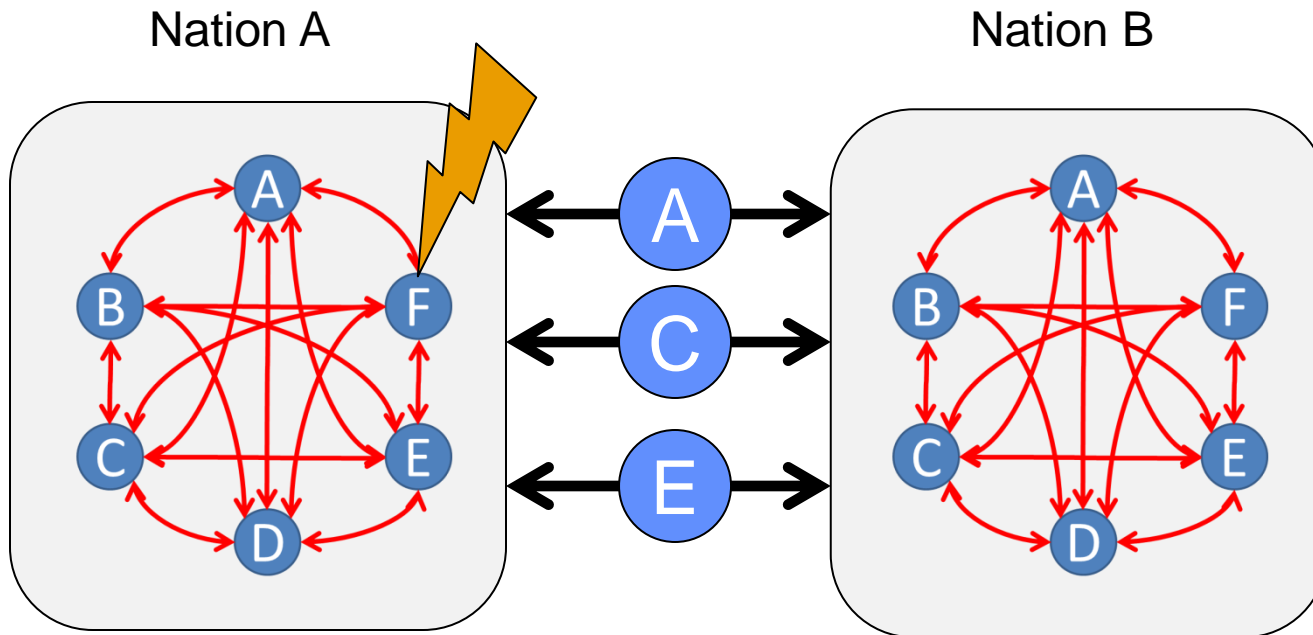
Nation State



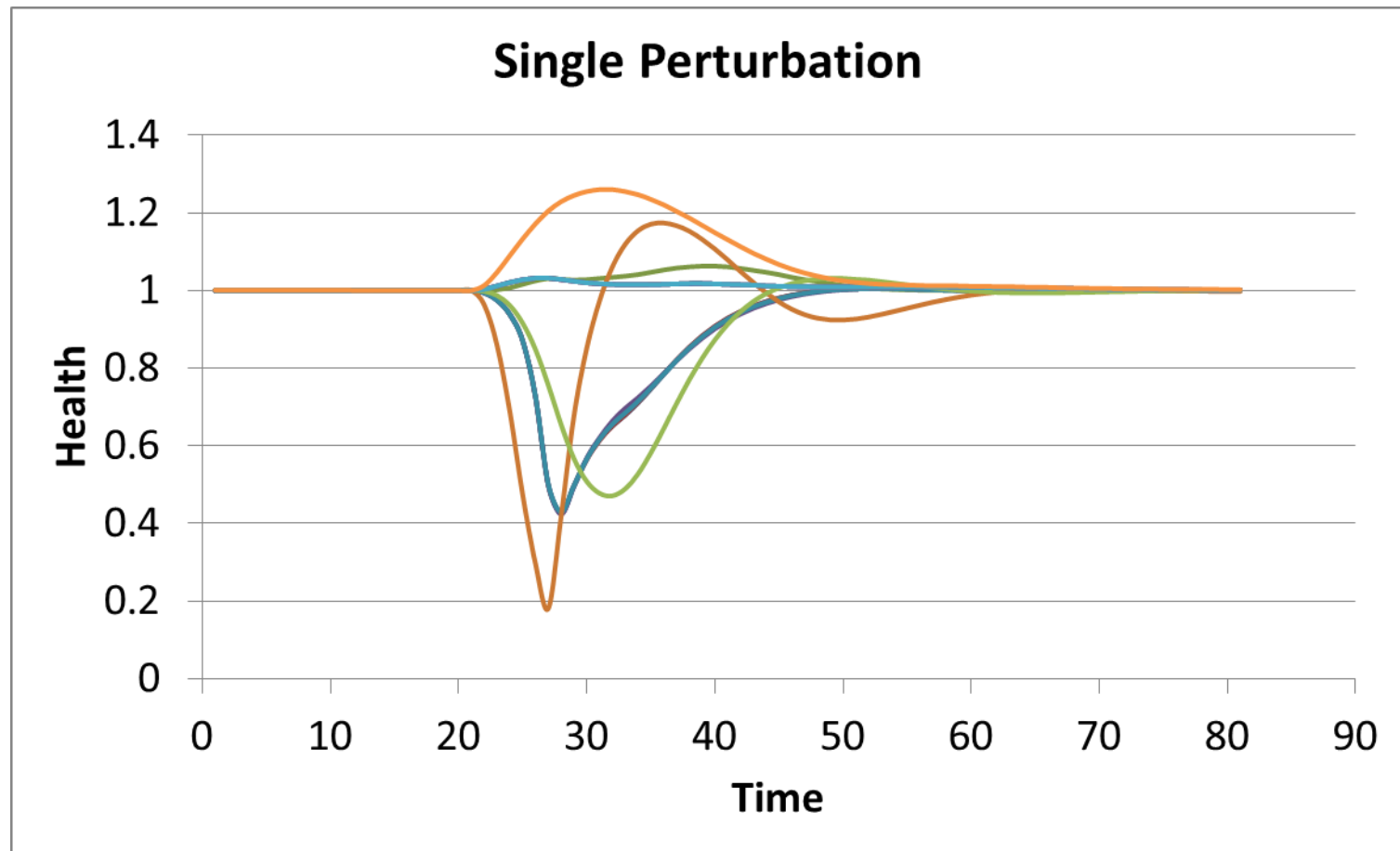
Resource Translation



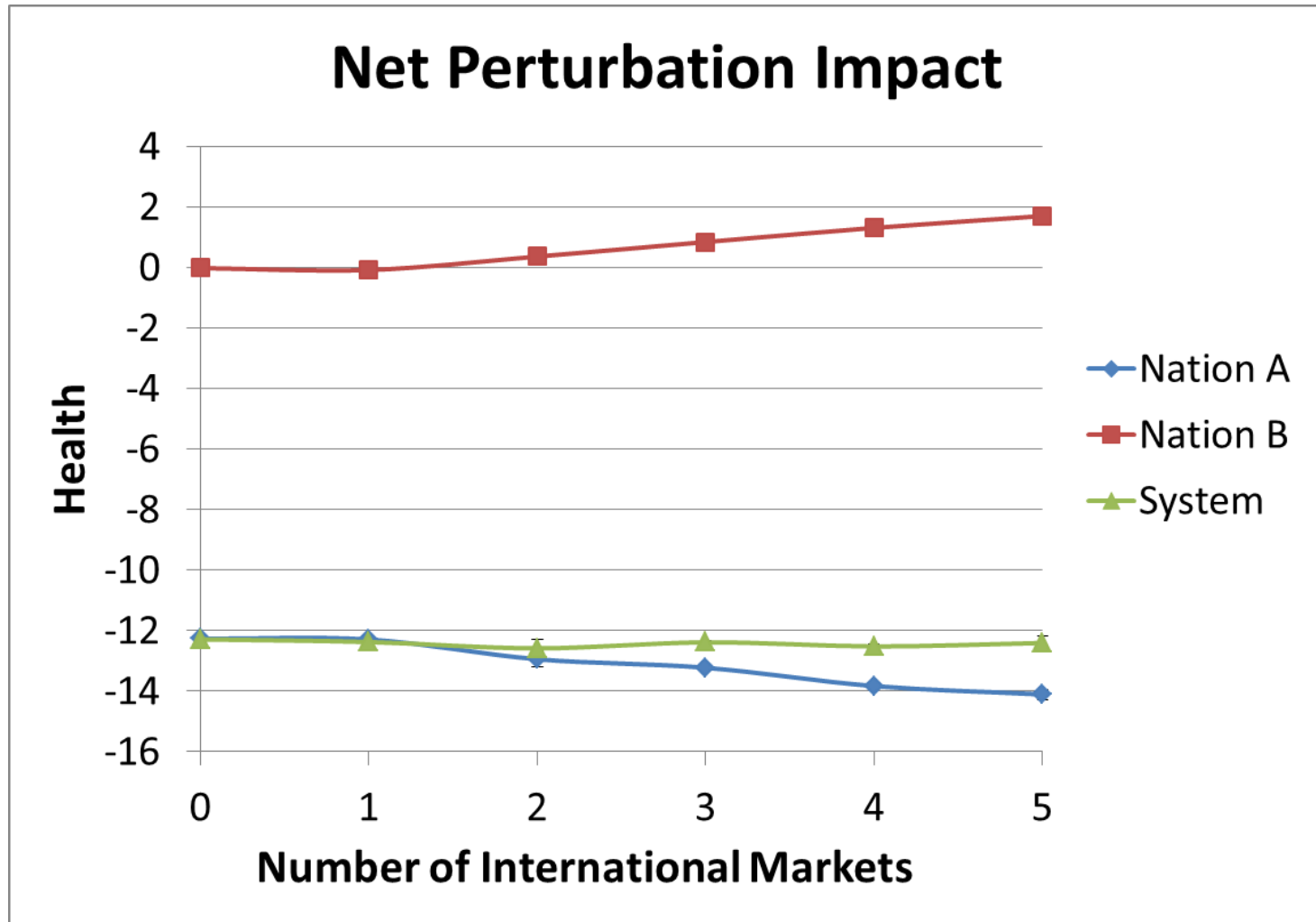
Trade Network



System Response



Perturbed Resource Not Traded



Tire Production



Production Disruptions Spread Shocks

The upward path of rubber and tire prices

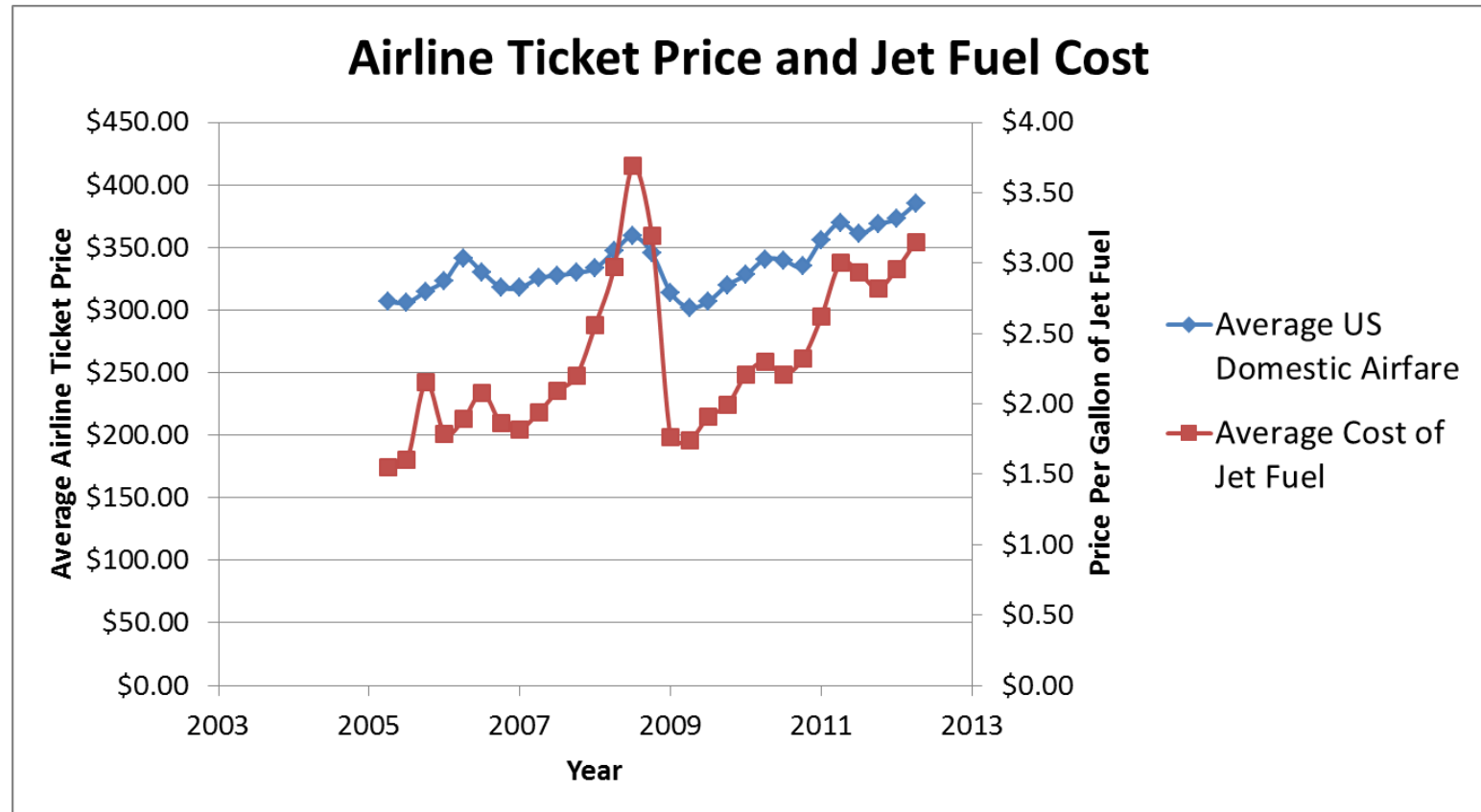
While tire prices have increased steadily over the past decade, prices for rubber have gone up dramatically. Big recent spikes in rubber prices could lead to big jumps in tire prices over the next year.



SOURCES: U.S. Bureau of Labor Statistics; International Monetary Fund

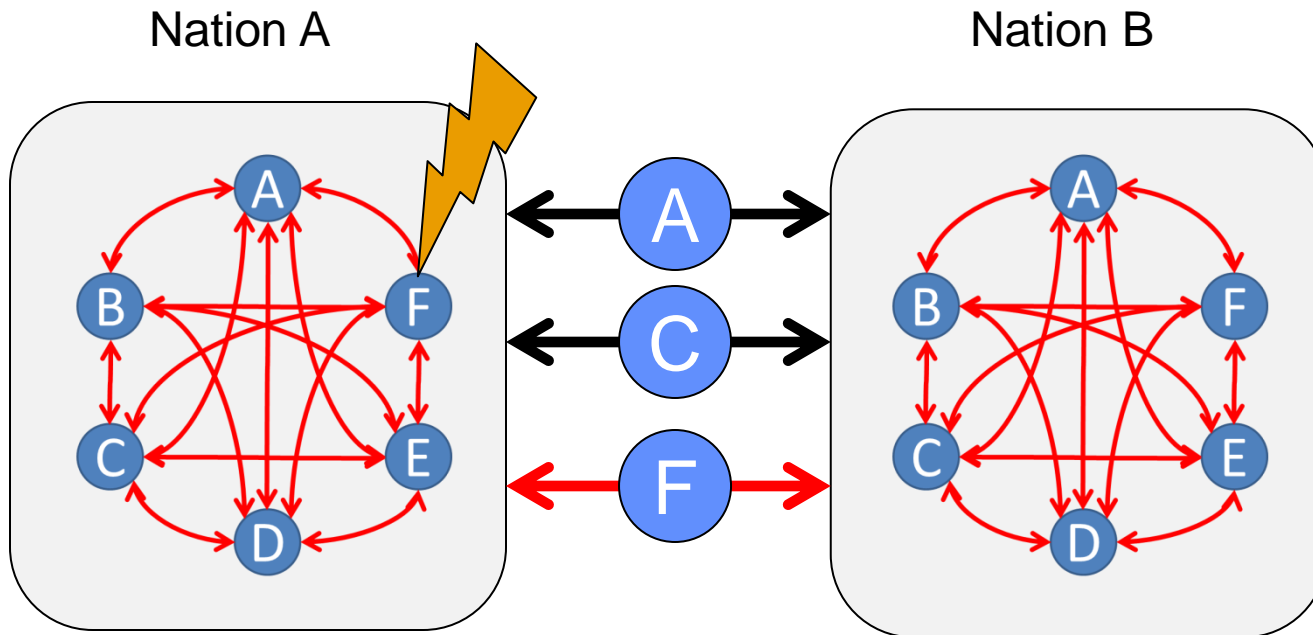
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Production Disruptions Spread Shocks

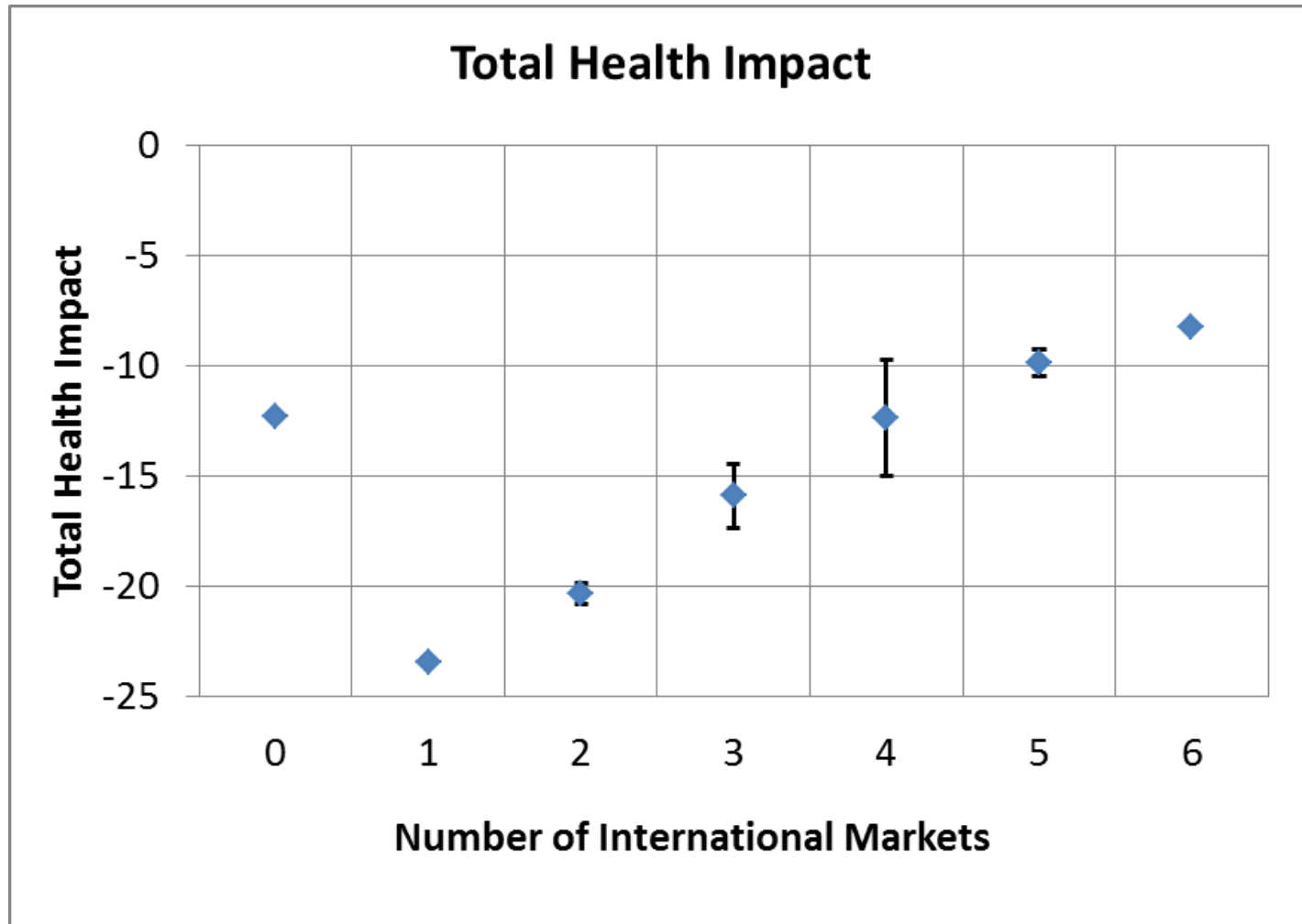


Data Source: Research and Innovative Technology Administration (RITA) and the Bureau of Transportation Statistics

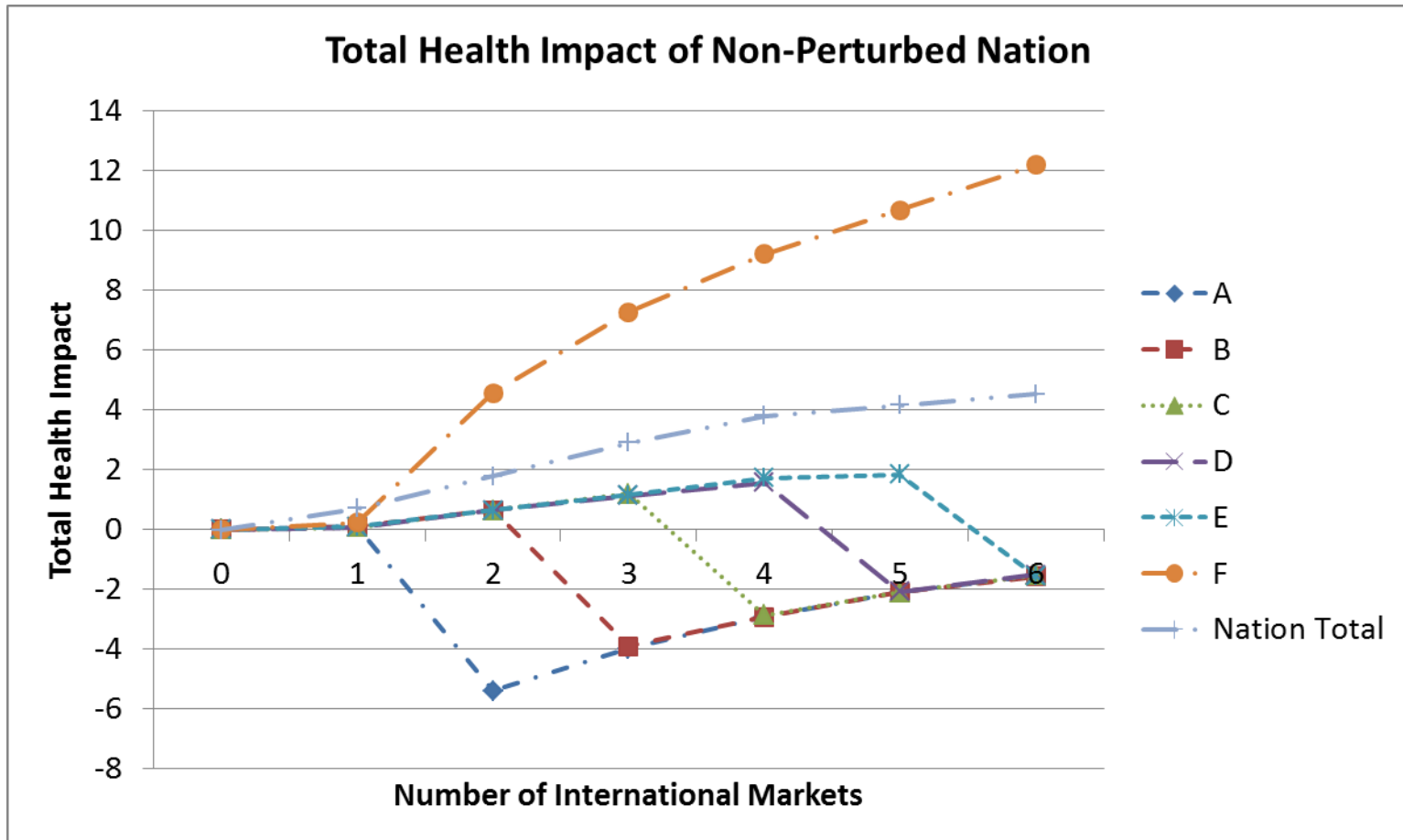
Trade Relations

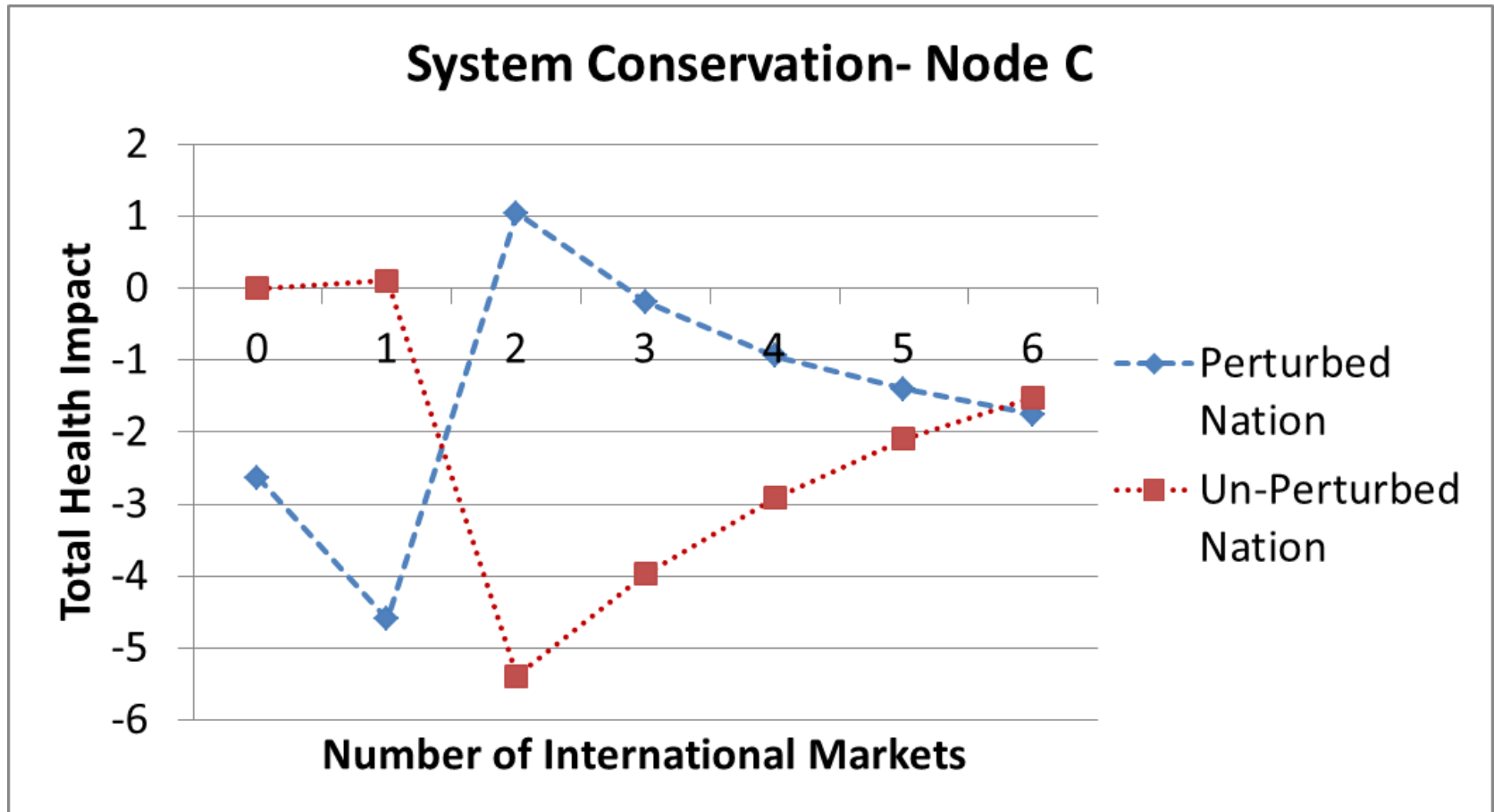


Perturbed Resource Traded

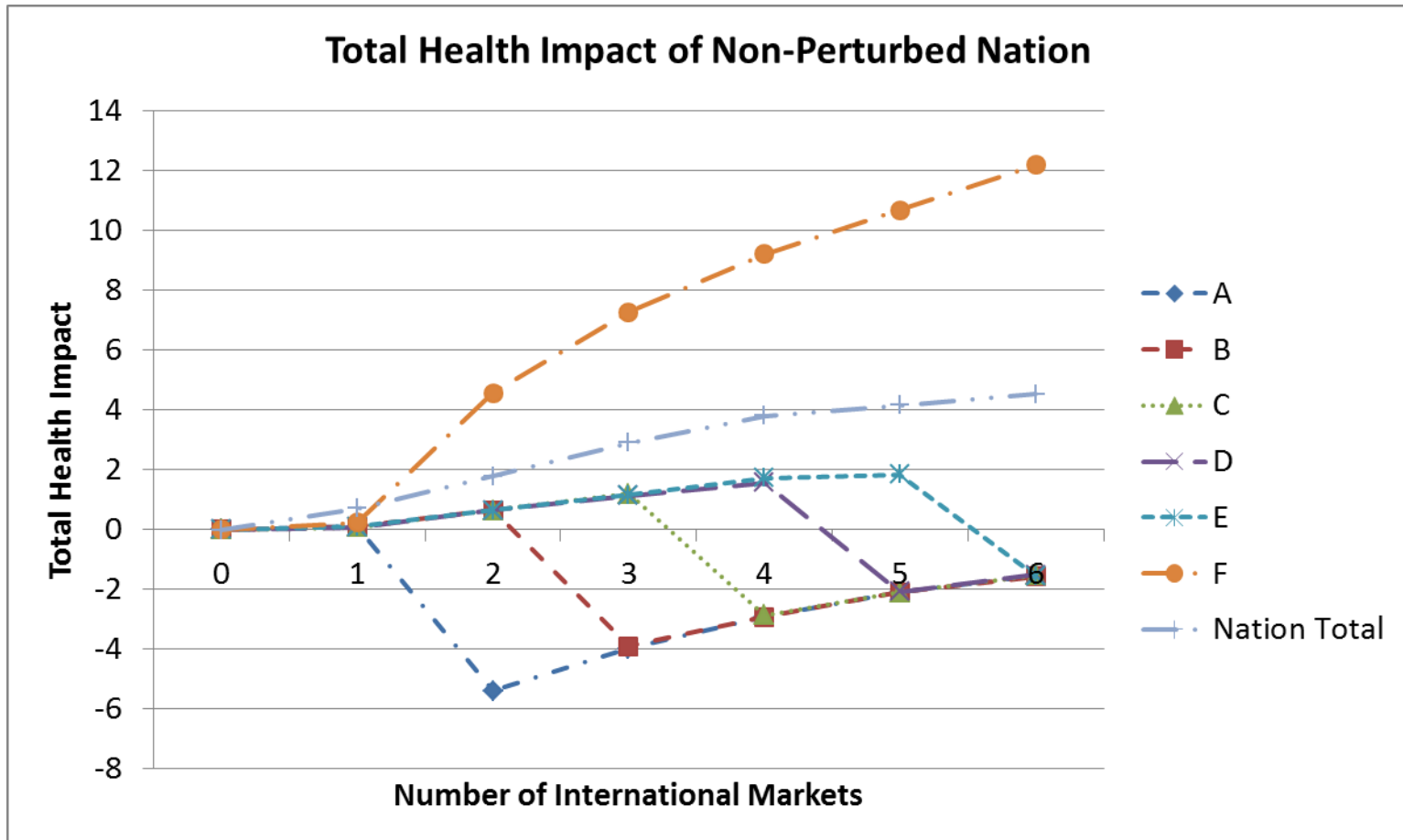


Individual Tradeoffs



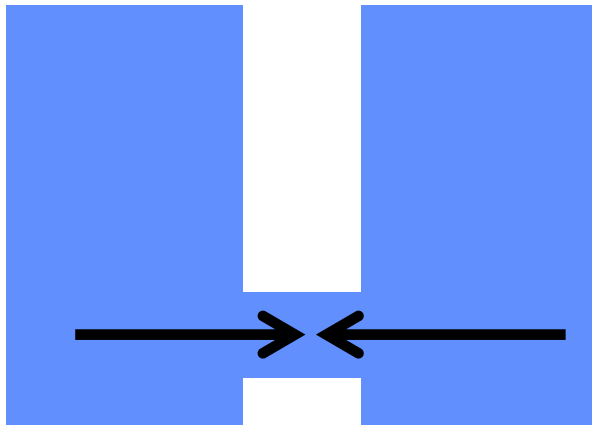


Individual Tradeoffs

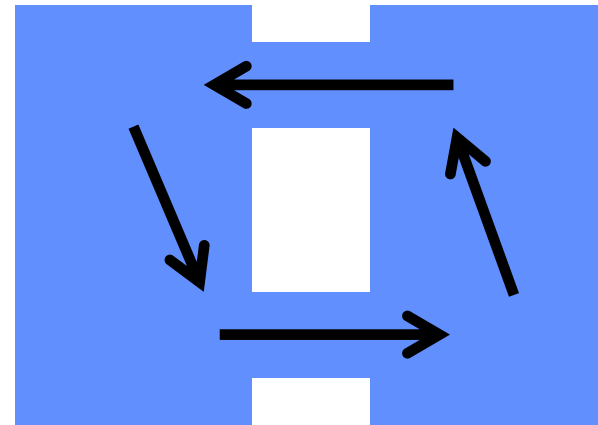


Perturbation Blocked

One connection



Multiple Connections



- Industry protection
- Trade relationships
 - Targeted embargoes
- Supply chain analysis



Questions?